



USING MATHEMATICS

Course Guide

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1 Introduction

Welcome to MST121 *Using Mathematics*. We hope that you will find the course enjoyable and rewarding!

This *Course Guide* gives you an overview of the learning outcomes of this course, the course components, assessment and study support, to help you to plan your study.

You should begin, now, to make some preparation for studying MST121. In this mailing you will find preparatory materials, including the *Guide to Preparation* and the *Revision Pack*, to help you to refresh your mathematical skills. You should also have, or be making arrangements to obtain, an appropriate computer running *Windows*, and be familiar with the basic *Windows* procedures in Section 2 of the *Guide to Preparation*.

On successful completion of MST121, you will have the mathematical knowledge and skills to study other courses that *use* mathematics. You will also have gained experience in using mathematical and statistical software, and should have developed general skills for learning and communicating mathematics. If you go on to study MS221, then you will be well prepared to take further mathematics courses.

2 Course learning outcomes

The following list of outcomes indicates what you should be able to do by the end of the course.

Knowledge and understanding

You should be able to:

- ◊ Recognise and work with basic mathematical language, and objects such as sequences, series, functions and graphs.
- ◊ Understand the use of coordinate geometry, matrices, calculus and statistics in simple situations.
- ◊ Perform elementary differentiation and integration.
- ◊ Describe the need for justification and proof.

Cognitive skills

You should gain an appreciation of:

- ◊ Mathematical ideas and ways of thinking mathematically.
- ◊ The need for justification and proof.
- ◊ The mathematical modelling process.

Key skills

You should:

- ◊ Improve your learning and performance skills (e.g. your ability to organise study time, to study independently, to learn from feedback, and to meet deadlines).
- ◊ Develop your skills for communicating mathematical ideas including the use of mathematical language and terminology in sentences.
- ◊ Be able to appreciate mathematical models of simple situations.
- ◊ Develop skills for using a computer algebra package (*Mathcad*) in connection with mathematical problems.

Practical and/or professional skills

You should gain an ability to:

- Develop logical and mathematical argument.
- Use a computer algebra package (*Mathcad*) for algebraic manipulation, differentiation and integration.
- Use appropriate statistical techniques when handling data, including a computer package (*OUSTats*).
- Interpret statistical data.
- Provide appropriate diagrams and charts to support statistical information.

Your understanding of these mathematical ideas is assessed through individual, short, directed tutor-marked assignment (TMA) and computer-marked assignment (CMA) questions. Problem situations are described and a structure given for their solution by an appropriate method in longer TMA questions. Some questions involve making critical observations about their answer.

Your written communication is assessed in the TMAs. In many cases, credit is given for the clarity of your presentation.

Improving your own performance is implicit in the course and not explicitly assessed. Evidence of your ability to work with a computer will form part of your TMA answers.

3 The course components

The main MST121 course components are described below.

Study texts

MST121 is made up of the following four **blocks** of study.

- Block A Mathematics and modelling
- Block B Discrete models
- Block C Continuous models
- Block D Modelling uncertainty

Each block is divided into several individually bound **chapters**, and has associated with it an **exercise booklet** containing exercises and solutions, and a **computer book** containing software-based activities.

Most chapters in MST121 contain the following elements:

- a **study guide**, which gives information on the structure of the chapter, and an **introduction**;
- several **sections**, with **examples**, **activities** and **comments** on those activities, a **section summary**, and **exercises** to provide practice;
- a **chapter summary**, including a statement of **learning outcomes**;
- **solutions** to activities and exercises.

Some chapters include a **block introduction** or a **block summary**, and some contain an **appendix** related to particular teaching sections.

Your study will be guided by the chapters, and much of your study time will be spent working directly from them. You will gain most benefit from your study if you work with a pencil and paper to hand, reading the chapters, annotating them and making your own notes. We advise you to keep these notes, and others that you make (for example, notes from tutorials and your rough drafts of assignments), in a ring binder or notebook, for ease of reference.

Some sections and their activities require the use of resources beyond the chapters themselves. These resources are specified in the chapter study guides, and their associated icons (see below) appear at the beginning of the appropriate sections.

You should also have your calculator and the course *Handbook* available.



indicates that you will need your computer



indicates that you will need audio CD playback equipment



indicates that you will need DVD playback equipment

In addition, there may be times other than those specified when you wish to use your computer to check something. When using your computer, do avoid sitting at the screen for long periods without a break, and keep a pencil and paper to hand for any notes that you need to make.

On average, most students are able to study a chapter from the course in about 15 hours, including working through the associated computer work, audio-visual material and the relevant assignment questions. Towards the beginning of the course, you may find that your study takes a little longer, particularly if MST121 is your first Open University course. However, many students do find the material in Block A to be demanding, so you may find that the pressure of study is reduced when you reach Block B. You may find that the weeks in which assignments are due demand more of your time too. There is a lot of material in Block C, including an introduction to calculus; this is one of the most important areas of mathematics, particularly for applications of mathematics, and it is developed in a number higher-level courses. Accordingly, you may need to reserve a little more time to study Block C, particularly if you are going on to other courses in mathematics, physics or electronics. Most students find the statistics in Block D fairly straightforward, but this is followed by the final assignments, covering the whole course, for which you are likely to need to review your work from throughout the course.

Calculator

You need a scientific or graphics calculator for parts of the course. The graphics calculator used in the course MU120 is suitable, but any scientific calculator should be sufficient. If you are not familiar with your calculator, then you should practise using it with the help of its manual, preferably before the course begins. Some guidance is given in the *Guide to Preparation*, and there are further opportunities for practice in the *Revision Pack*.

Computer software

The software package *Mathcad* and associated course files are supplied on the CD-ROM in the same mailing as this *Course Guide*. The process of installing *Mathcad* and the course files is described in Chapter A0. The activities associated with these course files are given in the computer books. The document *A Guide to Mathcad* provides a source of reference to the features of *Mathcad* used in the course. Another software package called *OUSTats* is used later in the course.

Audio bands

Audio bands are used in some parts of the course, usually to talk you through material printed in the text, and occasionally in conjunction with your computer. Do stop, start and replay these bands as often as necessary.



Video bands



The DVD includes video bands of various types. Some of the bands are linked directly to the main course texts, and should be used when indicated by these texts and on the *Study Calendar*. The 'Algebra workout' bands for Blocks A, B and C cover more general techniques in algebra, taking you through the basics step-by-step.

- Band A(i)* At home with MST121: in this band, two former MST121 students and a tutor describe their experiences with the course and give some useful advice.
- Band A(ii)* Algebra workout: Simultaneous equations
- Band A(iii)* Visualising circles
- Band A(iv)* Algebra workout: Quadratic equations
- Band A(v)* Algebra workout: Powers and logarithms
- Band B(i)* Algebra workout: Sigma notation
- Band B(ii)* Networks and matrices
- Band B(iii)* Algebra workout: Arithmetic with matrices
- Band B(iv)* Algebra workout: Working with vectors
- Band C(i)* Algebra workout: Differentiation
- Band C(ii)* Visualising the derivative
- Band C(iii)* Algebra workout: Integration
- Band C(iv)* Algebra workout: Differential equations
- Band D* Sampling distributions

Supplementary video material

A series of fifteen video bands on two DVDs is associated with the three courses MU120, MST121 and MS221. You are likely to find all of these programmes interesting and enriching as you study, but some are more explicitly associated with MST121 course chapters. The first DVD comprises eight bands associated with MU120, and the second has four bands for MST121 and three for MS221.

Study Calendars

There is a *Study Calendar* for MST121 that gives the starting date for your study of each chapter and the dates when the assignments are due. It also gives schedules for the audio and video bands.

If you are studying MST121 starting in February, and you are studying MS221 as well, you should use the combined MST121 and MS221 *Study Calendar*. Although the cut-off-dates are the same, the timings of your study of some sections will be different if you are studying both courses. Please make sure that you use the *Study Calendar* which applies to the course(s) you are studying.

The *Study Calendar* for studying MST121 and MS221 together is printed on the back of the one for MST121.

Handbook

The MST121 *Handbook* contains a list of notation and a glossary of technical terms, arranged alphabetically, together with key results and formulas, organised according to the chapter in which they appear.

The *Handbook* is a key source of reference throughout the course and you should add your personal annotations to it. In theory, therefore, there is no need to memorise material from the course. However, the more notation and terminology you can remember and understand, the easier you will find it to study the course materials and to do assessment questions confidently. Also, many results and techniques from MST121 will be used in MS221 and in other second- and third-level mathematics courses.

It is a good idea either to use a pencil or to use 'Post-it' stickers for your annotations until you are confident which type suits you best.

Stop Presses

The *Stop Presses*, printed on pink paper, act as a course newsletter containing useful and often essential information, such as errata, how to report other errors, what to do if you need help, and more detailed descriptions of the video bands.

It is important to read each Stop Press as soon as it arrives, and to make a note of any points which affect you.

FirstClass computer conferences

There is an MST121 'News' conference on FirstClass, as well as an MST121 student conference for each presentation.

4 Assessment

The assessment for MST121 consists of five **tutor-marked assignments** (TMAs), where you provide written answers, and three **computer-marked assignments** (CMAs), which contain multiple-choice questions. These assessments are contained in three assignment booklets. The assessment on the course is summarised in this table.

<i>Assignment number</i>	<i>Weighting</i>	<i>Material covered</i>	<i>Notes</i>
TMA 10	0%	Preparatory; Revision Pack	formative
CMA 51	0%	Preparatory; Revision Pack	formative
TMA 01	20%	Block A	substitutable
TMA 02	20%	Block B	substitutable
TMA 03	20%	Block C	substitutable
CMA 41	10%	Block D	non-substitutable
TMA 04	20%	Blocks A, B, C, D	non-substitutable
CMA 42	10%	Blocks A, B, C, D	non-substitutable

TMA 10 and CMA 51 are formative, which means that your results for them do not count towards your final course result. These are practice assignments to help with your preparation for the course, and to give you early feedback on your mathematical work and, in the case of TMA 10, on how you present your mathematics.

The dates by which each assignment should be submitted are given in the *Study Calendar*. The cut-off date for each of TMA 01, 02 and 03 is the last date on which your tutor may accept your work for marking, unless he or she feels that there are exceptional reasons why you should be allowed to submit late. No such 'extensions' are possible for the CMAs or for TMA 04. TMAs should be sent directly to your tutor, and CMAs to the Open University (in the envelope provided). You are advised to keep copies of all the assignments you send and, if possible, to obtain proof of posting, just in case of loss in the post.

It is important to plan your study to include time to work on the assignments, allowing time to refine and check what you write – and perhaps to act on any advice that you might seek from your tutor. We recommend that you tackle the appropriate assignment questions at the end of studying each chapter in the course, and then review the whole assignment just before you submit it in advance of the cut-off date.

In TMA 04 you will be asked to attempt three out of four longer questions on the course. TMA 04 is subject to a threshold: you must obtain a minimum overall grade of 30% on this assignment in order to pass the course.

Your overall grade

To pass MST121, you will need to have performed satisfactorily in the assessment component as a whole – this would normally mean obtaining an average of at least 40% across all the assignments (except TMA 10 and CMA 51), and achieving at least 30% on TMA 04. Your overall mark will be computed in line with the procedure outlined in the *Assessment Handbook*, taking into account the weighting for each assignment as given in the table above.

If, for whatever reason, you do not submit or achieve only a low mark on one of TMA 01, 02 or 03, your overall grade may be improved by a system known as **substitution**. This means that your grade for one of TMA 01, 02 or 03 can be substituted by your overall course grade (if this is higher), when that is calculated at the end of the course. If substitution would benefit your overall score, the process is carried out automatically. The effects of the substitution system are that:

- you are not penalised too severely for a low mark on one of TMA 01, 02 or 03;
- it is advantageous to submit all the TMAs, even if you are not able to do yourself justice on some parts.

You will also receive useful feedback.

MST121 is a Level 1 course, and thus at the end of the course you will be awarded either a pass or fail grade.

If you have achieved satisfactory marks across the assessment overall, and made a reasonable attempt at TMA 04 but not achieved the threshold, then you may be entitled to submit an alternative TMA 04 soon after the end of the course. You will be contacted directly if the marks on your assignments put you in this position.

5 Study support

Your tutor

Your Regional Centre will send you the name and address of your tutor, who will support your academic study and provide feedback on your work. Every TMA that you submit on time should be returned marked by your tutor, with comments. These comments should point out what you have done well, while indicating any misunderstandings and errors and giving advice on how to avoid these. TMAs are the basis for correspondence tuition, and should enable you to establish a dialogue with your tutor.

You will receive details of other ways in which your tutor may offer you support, for instance with face-to-face tutorials or computer conferences. You will be able to obtain details of face-to-face tutorials provided by other tutors, which you are entitled to attend. You are strongly encouraged to attend face-to-face tutorials, if it is feasible for you to do so, as they provide an opportunity to receive focused tuition, to work with other students, and to discuss your own questions.

If it is impossible for you to take part in organised activities, please make contact with your tutor, and maintain contact through telephone, email, letters or fax.

Other students

Talking with fellow students about the mathematics you are studying is a valuable way of enhancing your learning. There are opportunities for this at tutorials, and you can arrange further contact by exchanging addresses, email addresses or telephone numbers with other students in your area, perhaps forming a 'self-help group'. It may be possible to book a room at a study centre for self-help group meetings; if so, your Regional Centre will be able to supply details. In addition to any local arrangements that you may make with your tutor and fellow students, the Open University Students Association (OUSA) supports a computer conference for MST121 students, using FirstClass software.

Telephone help-lines

As mentioned above, you may choose to contact your tutor and fellow students by telephone. You may also wish to use telephone help-lines. For example, there is a **telephone tutorial service** run on a voluntary basis by members of the Faculty of Mathematics and Computing who endeavour to answer your queries. There is also a **computing help-line** to support students on courses which involve the use of a personal computer (like MST121).

Details about these services are given in *Stop Presses*.

Other support

Regional Centres provide all students with study support for problems that are not directly related to the course materials. New students studying MST121 will usually receive this support from their tutor. If you have any non-academic problems affecting your Open University studies you should consult the **Study Support Team** at your Regional Centre.

Details about the Study Support Team are given in the literature sent from your Regional Centre.